Phrenology, Localization, and Learning Disabilities[1]

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In reading Mann's essay, it was interesting to note the repetition in the field of education of a set of concerns which preoccupied neurophysiology nearly sixty years ago. In 1912, S. I. Franz wrote a paper entitled "New Phrenology," in which he appropriately argued against the increasing degree to which concepts of cerebral localization of function had been developed. He rejected these on both empirical and philosophical grounds; in so doing, he simultaneously made a major positive contribution resulting in the work of Lashley (1929) and a gross error in under-estimating the importance of the study of differential functioning of the regions of the brain. It is possible that sixty years from now the same may be said of Dr. Mann's argument.

It is perhaps historically inevitable that over-attention and over-enthusiasm for a particular strategy for dealing with a larger problem will result in a vigorous and unnecessarily extreme reaction. Dr. Mann is quite properly annoyed with the increasing trend to over-specify the defects in learning mechanisms presumably underlying school failure, and also with the unsubstantiated, unjustified, and exaggerated claims that if one pays attention to these specifics, they will provide a modern educational panacea. We can agree at the beginning that no substantial body of evidence has been produced to support the contention that strategies for educational repair based upon current notions of specificity in learning disability have been signally successful. Claims to the contrary represent a kind of self-advertisement which should be treated with both disregard and disrespect. However, it would be tragic if one's justifiable emotional reaction to dubious claims to virtue were to cloud one's judgment and lead to conclusions that would inhibit rather than enhance serious study of the causes for

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school failure. In my view, it is this pitfall that Dr. Mann has failed to avoid.

Central to Dr. Mann's argument is the view that there is no value in attempting to define the specific components of cognitive functioning and relate such information to school failure. As a corollary, he argues that there is no useful relationship (and indeed, presumably can never be one) between information on specific sub-organizations of cognition and strategies of instruction. These conclusions lead him to the view that the proper strategy for dealing with learning failure is the reiteration of the very patterns of instruction that produced failure in the first place. Stated in this form, the ideas he presents are unexciting and the arguments in their support uncompelling.

Dr. Mann's primary technique of evaluation (of which he is entirely aware) is that of destroying straw men. He selects two highly popular, questionably based, and often uncritically accepted strategies for evaluation and instruction (Frostig, 1964; Kirk, 1968), raises questions about the processes they name, and suggests that their value as strategies for instruction is trivial. With Engelmann (1967), he points out that many of the processes presumably influenced by the "special curriculum" could have been affected equally well by standard forms of academic instruction. This may well be true. But what general theoretical conclusions can be drawn from this argument?

Can one assume that a particular technology which claims to base itself on a general theory is an appropriate and valid reflection of that theory? Obviously not. History is replete with both faulty expressions of general theory and primitively ineffective technologies justifying their existence on the basis of such theory. Though these practical applications may sometimes be worthless, the theory itself, when properly developed both conceptually and technologically, may in many instances be of great value. To provide perspective, it is useful, I think, to consider briefly some instances of the gap between correct theories and the trivial practices that adherents claimed stemmed from them.

In earlier days there was (Davies, 1955) a general theory that the brain was not homogeneous with respect to function, and that different anatomic features of it had differential importance for functioning. This general theory subsequently led to the discovery of a valuable body of information with respect to the localization of behavioral function; this information continues to be profitable. The name of this general theory when it first appeared was phrenology. The most immediate application of this theory (see Davies, 1955) stated that the bumps on a person's head accurately reflect the differential growth of the brain structure and that by feeling them, one could gain information about ability status and personality. Of course, this particular misapplication fell into deserved disrepute, but it is clear now that the value of the general theory from which it derived could not have been properly estimated by focusing on that particualr expression of it. The term "phrenology," originally applied to the general theory, gave way to the term "localization," "phrenology" being used now to describe one of its misguided expressions. This is further evidence of the ease with which the general theory may be confused with a particular expression of it.

Other illustrations follow: There is an idea extant in the land (particularly among unsophisticated people) that fish is good "brain" food. While this idea is as ridiculous as the notion that one can determine abilities and personality attributes by reading bumps on the head,

it is important to note that it is the particular expression of a more general theory that protein may have differential value for the development of the central nervous system. This more general theory *is* viable and constitutes the basis for much fruitful contemporary research.

The story of Mesmerism constitutes another example of the need to differentiate a particular expression from its general theoretical context. While Mesmerism did not survive as a viable formulation, the more general view from which it derived, namely, that introducing electricity into the body can induce or alter various states of being, is still viewed as a good idea and constitutes what is probably one of the basic premises underlying modern electrophysiology.

Finally, few serious-minded people would have thought worthwhile the early attempts to predict outcomes in dice and other games of chance. However, the more general view to which these efforts were conceptually linked—that rules could be established for determining the likelihood of different outcomes—has led to probability, game, and decision theory. In all of the foregoing illustrations, the particular expression might have misled us in our attempts to appreciate the general theory.

RELATION OF COGNITIVE COMPONENTS TO INSTRUCTIONAL STRATEGY

Against this background, let us return to the issue of the theory of specific cognitive competence and its relation to educational practice. Mann's admonition that teachers return to the good old days of the teaching of reading, writing, and arithmetic is too late. If the methods implied by such an approach had worked with children who had learning disorders, the theory of specific learning disabilities would probably not have evolved in the first place. Its very existence is testimony to the failure of traditional systems of instruction to teach academic skills to large groups of children.

Since I have argued that Mann's critique is unfortunately based on a review of procedures of dubious value, rather than of the theory and its worth, it is proper to ask what facts have been advanced that lend credibility to the view that specific learning disabilities do, in fact, exist. There is excellent evidence from a variety of sources that cognitive structure is multi-faceted, and that differential patterns of cognitive competence and incompetence may exist in the same individual. The following examples give a good idea of the kinds of evidence that are available:

1. Studies of psychopathological states have indicated that there can be specific losses in certain areas of cognitive functioning when functioning in other areas remains intact. Such highly specific losses as the ability to count (acalculia), to name objects (agnosia), or to use language expressively (motor aphasia) or receptively (sensory aphasia) suggest the variety of results of differential central nervous system damage, and serve to illustrate how specific incompetences may exist in individuals who demonstrate competence in other areas.

2. There is evidence for specificity of function in the factorial examination of intellect. Guilford (1967), on increasingly empirical grounds, has demonstrated the effects of a large number of intellectual abilities. The disagreement between those factor analysts who stress general (G) versus specific (S) abilities (McNemar, 1964) is irrelevant to the issue of whether S is a viable formulation, since the presence of G in no way excludes the existence of S. The two can and do co-exist.

3. That aspect of Piaget's work (1952) which deals with stages of mental organization constitutes another line of evidence which supports the view that cognitive structure is multi-faceted. A child may function at one stage in one substantive area, but at a different stage in another substantive area.

4. Those children who fail in specific skills such as reading or arithmetic or spelling or writing, but who, in more general terms, are characterized by good intelligence, constitute living evidence in school that a pattern of mixed cognitive competence and incompetence can exist in the same individual. Moreover, these individuals demonstrate that cognitive structure has many aspects which are differentially vulnerable.

In the face of this evidence, the denial of cognitive sub-sets and their potential relevance to educational rehabilitation represents a kind of sophisticated know-nothingism. It argues for a retrogressive revisit to the very methods which have failed, in the futile expectation that more of the useless will be useful. But, more importantly, the adoption of this view can serve to inhibit serious inquiry into the relation of cognitive specifics to instructional failure, and so function as a deterrent to the development of a useful experimental education.

For example, Birch (1962), has hypothesized that there are at least three aspects of sensory functioning that must be considered in relation to later complex learning:

1. Sense systems are not co-equals; they are hierarchically organized. Thus, one needs to define in given children which systems are dominant and the conditions under which particular patterns of dominance occur.

2. Within any given sense system, what is the nature of the selective development of intrasensory differentiation, e.g., which aspects develop first and when do competences emerge?

3. Information deriving from different sense avenues may be integrated. Moreover, information from one sensory modality can be conditioned to be equivalent to information from another sensory modality. The ability or inability to form such equivalences needs to be investigated.

On the basis of his analysis of the reading task itself, he viewed all of these hypothesized issues as relevant. Some of these hypotheses have been empirically tested. Birch & Belmont (1964) have investigated reading ability in children with different degrees of adequacy in integrating auditory and visual information. They reported that in the first three grades reading ability was more closely related to auditory-visual ability than to intelligence itself. Bakker (1966, 1967) tested for differences in the hierarchy of visual and kinesthetic responsiveness of normal and backward readers. Using a psychophysical method to determine differences in responsiveness to visual and kinesthetic stimuli, he found that visual and kinesthetic discrimination were more similar in backward readers than in normal readers, in whom visual discrimination was far superior to kinesthetic discrimination. He inferred that there was less dominance of the visual over the kinesthetic system in backward readers. In both of the studies cited, hypothesized child characteristics were empirically determined and found to be related to school achievement.

However, the successful identification of basic psychological functions, and an analysis of the demands of school tasks may *not*, of themselves, be sufficient to overcome the learning disorders of children who fail in school. First, there is the unpleasant possibility that not all of the child's deficits can be

remedied. Second, there is the problem of a delivery system, i.e., how to teach, or more precisely, how shall the learning task be formulated? It is just possible that the search for new ways to formulate the school learning task, and structure the problem, may directly help to overcome the difficulties caused by the presence of irreversible deficits. This is a reasonable hypothesis based on findings from comparative, developmental, physiological, and social psychology which have demonstrated that differences in learning achievement represent products of different degrees of goodness of fit between the organism and the environment, and that environmental modifications may encourage higher levels of performance (Bortner & Birch, 1970). At best and even in normal children, actual school performances under particular conditions are probably only partial indicators of capacity. Levels of learning manifested in actual performances reflect interactions between possessed potentialities and the particular conditions of the task.

Illustrations of such a view may be found in several studies by Birch & Bortner (1966, 1967) in which they raised the question of the degree to which children possess concepts which are not available for use under ordinary conditions. When young normal children were shown a model object which "belonged" with the model, the children matched on the basis of stimulus properties. Thus, if the model object were a red button, and the alternatives for matching were a red lipstick case, a blue poker chip, and a spool of thread, the young children selected either the lipstick case, which agreed with the model in color, or the poker chip, which, had the same shape. Older children, in contrast, ignored the stimulus properties and selected the thread, which had a functional relation to the button, as the object which "belonged" with it. Did the younger children fail to select the thread because they did not understand its functional relationship to the button, or did they possess the concept but fail to use it under conditions of sensory competition? This question could be examined by testing the hypothesis that the younger children did understand the functional relationship but did not utilize it when their behavior could be guided by sensory information. If this hypothesis were true, it would be expected that a comparable group of young children, confronted with the task under conditions in which competition from sensory properties were reduced, would base their choices on their functional concepts. Birch & Bortner presented this and other problems under conditions in which the alternative choices contained no striking sensory attributes which matched the model. Behavior was not dominated by sensory properties under these altered conditions, and almost all of the young children made functional selections.

When this technique for differentiating between capacity and competence was applied to brain-injured children, essentially the same findings were obtained (Birch & Bortner, 1967). The tendency to use such abstractions as class membership and functional characteristics as bases for matching was facilitated in brain-damaged children when the competition of immediately present stimulus properties was systematically reduced.

Many studies support the view that the child's capacity may exceed his performance level as observed under ordinary conditions. Since these are fully reviewed elsewhere (Bortner & Birch, 1970) they will not be discussed here. It

is important to note, however, that psychologically and educationally meaningful differences in our estimates of children's potentials may occur when significant alterations are made in the task conditions. It follows from this that effective classroom learning in children with learning disorders will be enhanced by the elaboration of meaningful alterations in task conditions even in the presence of deficit.

What are the implications of these specifics for instructions? In the methods referred to earlier (Frostig, 1964; Kirk, 1968) there is a singleness of strategy which is quite unnecessary; it is dictated by habit rather than concept. The users of these methods have assumed that the identification of a region of cognitive deficit has as its educational remedy training in the defective area. This assumes first, that the defect is correctable and second that correction can occur at a later than normal stage in development. There is no sound or compelling evidence to support either of these expectations. If this application of the concept of specificity is ineffective, are we left with no alternative but a return to a theory of generalities? No! At least three alternatives exist:

1. One can seek to restructure instruction in such a way as to draw upon the individual's cognitive strengths rather than his weaknesses for the achievement of given goals. The studies (Birch & Bortner, 1966, 1967) on concept utilization referred to earlier illustrate how such restructuring might take place.

2. One can change the sequence of instruction so that demands are made in accordance with the emergence of competences.

3. One can turn to the use of prosthetic devices.

If all of these alternatives fail we can restructure the goals of education for children with learning disorders along more realistic lines. That is, we can lower, modify, and make more modest our expectations.

This view of the problem seems to me to be a more appropriate set of conclusions to derive from our mutual dissatisfaction with the current state of affairs than those which Mann has advanced. It is one that suggests potentially fruitful directions for psychological and educational research. Mann's conclusions, I fear, represent a counsel of despair which leads nowhere but to the past.

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